

Guidance for Integrated Monitoring

# The Vital Signs Analogy



# Importance of non-living components









# Topics

- Inventories
- Monitoring



# Topics

## Inventories

- Geologic Maps
- Soils Resources Inventory
- Geologic Features Survey





# Topics

## Inventories

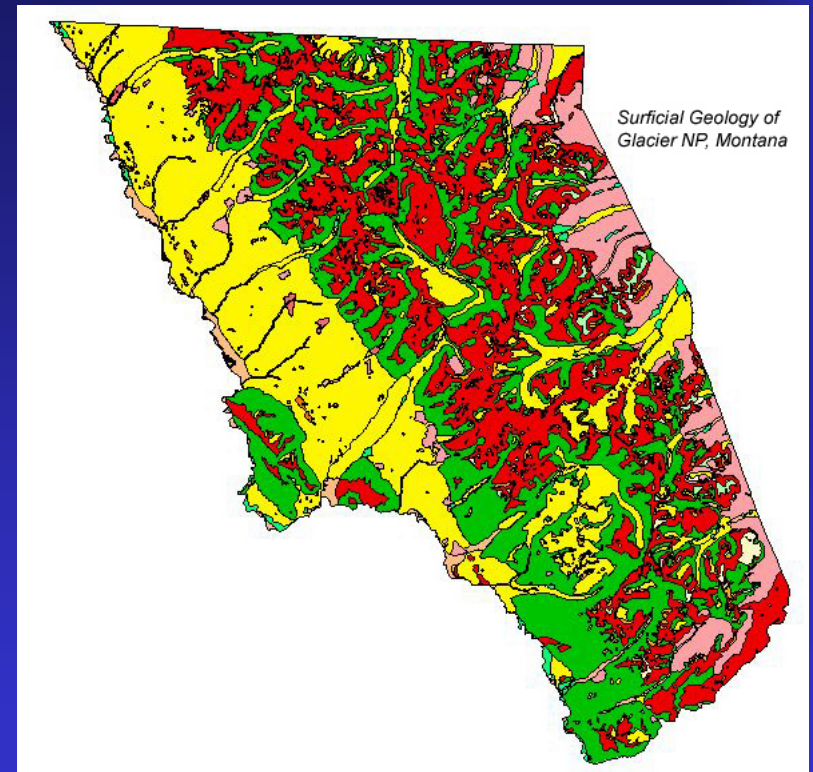
- **Geologic Maps**
- Soil Resources Inventory
- Geologic Features Survey

# 2 Types of Maps

## Bedrock



## Surficial

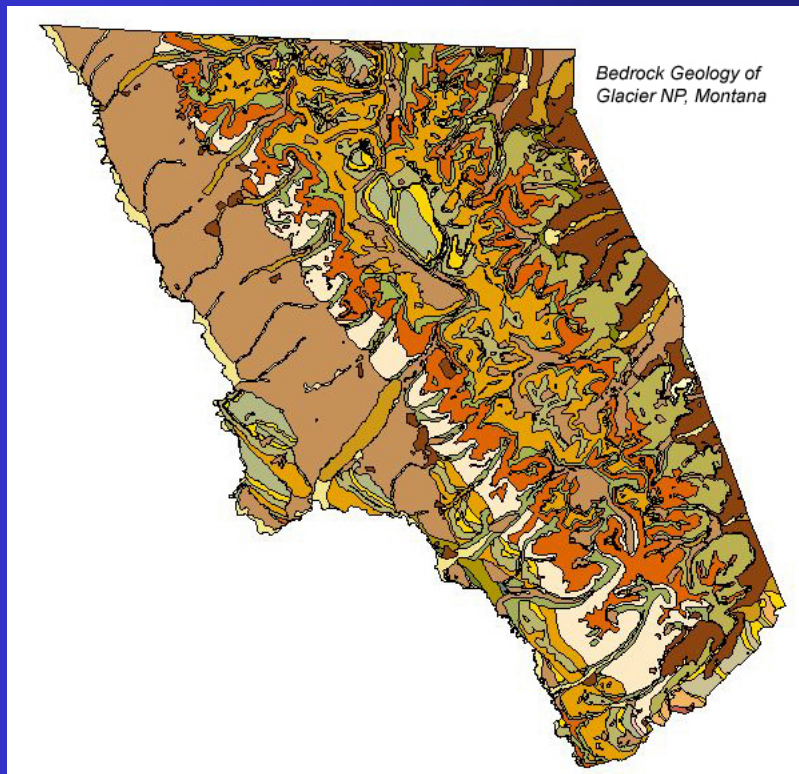




# Bedrock Geologic Map

Distribution and characteristics of solid rock

formations, where they occur at the land surface

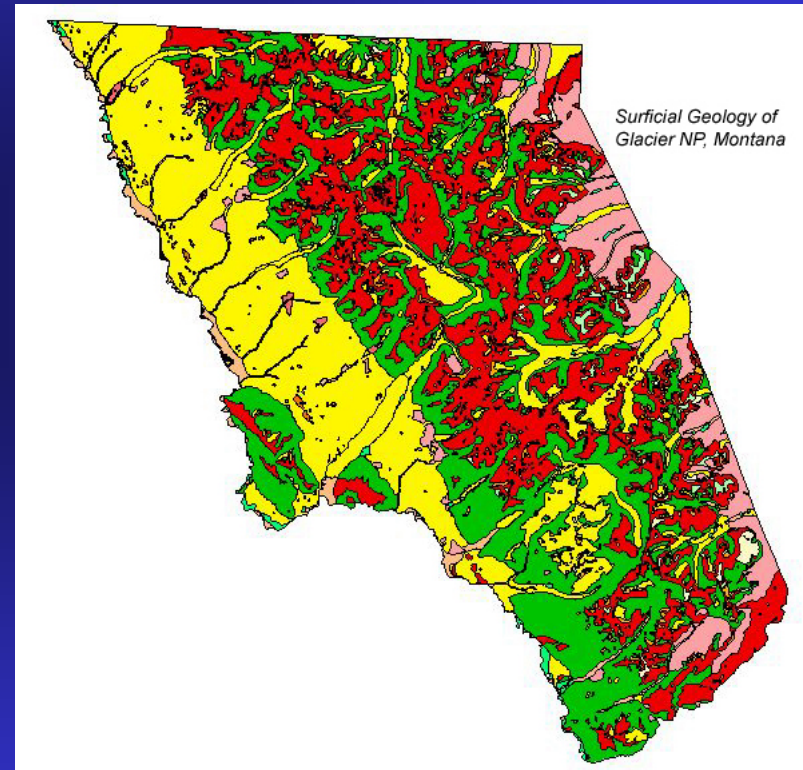


- Conveys information about the geologic history, including the origin of features and the processes that created them
- Used to identify scope and type of geologic hazards (rockfall, faulting, flooding, etc.)
- Used to identify location and type of resources (coal, ore deposits, ground-water, oil & gas, etc.)
- Provides basis for sound land use planning (hazards, engineering considerations, etc.)

# Surficial Geologic Map

Distribution & characteristics of unconsolidated deposits, weathered materials, & rock w/o regard to structure

- Conveys information about recent geologic processes and resultant features
- Key to understanding surface hydrology, near-surface groundwater, & watershed response
- Used to understand patterns of soil development and infer occurrences of flora, fauna, fire prone areas, archeological sites, etc. (other resources of concern)
- Used to identify erosional susceptibility



# Goals of the Geologic Resources Inventory

- “Scope” each park (~272 Natural Resource areas); involves site visit and round-table meeting
- Produce park specific geologic bibliography
- Deliver digital geologic map  
(currently using ESRI ArcView / ArcInfo formats)
- Develop encompassing geologic report

# Parks with Geology Mapping

19 complete

74 in progress

14 planned

Contact: Bruce Heise



# **Geologic Mapping**

## **Benefits to You**

- **Conveys past, present, and possible future ecosystem changes**
- **A tool that can significantly help identify location and type of other resources -- flora, fauna, fire prone areas, archeological sites, etc**
- **Key to understanding surface and subsurface hydrology and watersheds**
- **Significant factor in identifying erosion susceptibility**



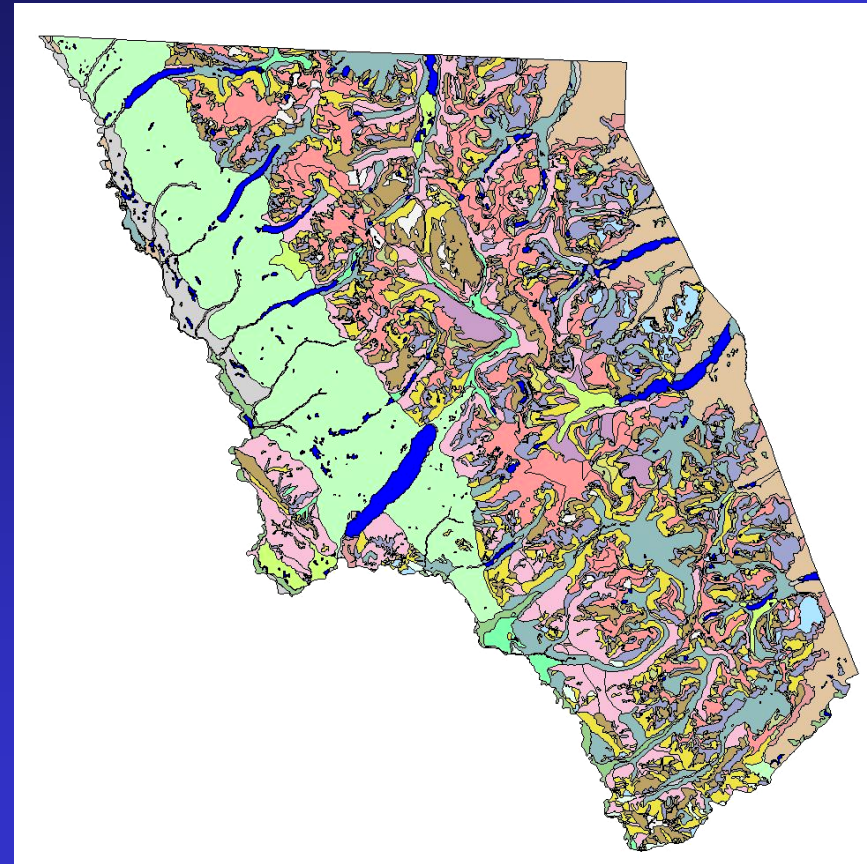
# Topics

## Inventories

- Geologic Maps
- **Soil Resources Inventory**
- Geologic Features Survey

# Soils Map

- Information on soil physical, chemical, and biological properties
- Erosion potentials (water & wind)
- Soil-vegetation relationships via ecological site descriptions
- Soil engineering information
- Climatic information
- Soil-water relationships



# Goals of the Soils Inventory

- “Scope” each park (~272 Natural Resource areas); involves site visit and round-table meeting
- Produce park specific soils report
- Deliver digital soils map  
(currently using ESRI ArcView / ArcInfo formats)
- Develop encompassing soils survey
- Develop soils information & education products



# Parks with Soils mapping

152 complete

35 in progress

4 planned

Contact: Pete Biggam

# **Soil Surveys**

## **Benefits to You**

- **Meets basic data need to begin to understand the soil-flora and soil-fauna relationships**
- **Aids in understanding population dynamics and species**
- **Helps in understanding natural and accelerated erosion rates**
- **Provides soil quality data used to understand soil habitat sustainability and the base of the food web**
- **A tool that can significantly help identify location and type of other resources -- flora, fauna, fire prone areas, archeological sites, etc**
- **Key to understanding surface and subsurface hydrology and watersheds**
- **Provides more site specific augmentation to information gained in geologic bedrock and surficial maps**



# Topics

## Inventories

- Geologic Maps
- Soils Resources Inventory
- **Geologic Features Survey**

# Geologic Features Survey







Capital Rock, MT

National Natural Landmark



Goal of  
assessing  
features will begin  
in  
FY-03

# **Geologic Features**

## **Benefits to You**

- **provides a record of ecosystem processes**
- **helps in understanding of habitat characteristics**
- **presents an information base that can improve identification of high potential sites for locating flora, fauna, fire prone areas, archeological sites, etc.**



# Monitoring

- Geologic Monitoring Guide
- Vital Signs Scoping Support
- Human Influences on Geologic Processes
- Existing Monitoring





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# **“How to” Guide to Natural Resource Monitoring**



## **Geologic Monitoring Chapter**

# Geoindicators Check List

## CHECK LIST

Geoindicators: natural vs. human influences, and utility for reconstructing past environments.

GEOINDICATOR	Natural Influence	Human Influence	Paleo reconstruction
Coral chemistry and growth patterns	H	H	H
Desert surface crusts and fissures	H	M	L
Dune formation and reactivation	H	M	M
Dust storm magnitude, duration and frequency	H	M	M
Frozen ground activity	H	M	H
Glacier fluctuations	H	L	H
Groundwater quality	M	H	L
Groundwater chemistry in the unsaturated zone	H	H	H
Groundwater level	M	H	L
Karst activity	H	M	H
Lake levels and salinity	H	H	M
Relative sea level	H	M	H
Sediment sequence and composition	H	H	H
Seismicity	H	M	L
Shoreline position	H	H	H
Slope failure (landslides)	H	H	M
Soil and sediment erosion	H	H	M
Soil quality	M	H	H
Streamflow	H	H	L
Stream channel morphology	H	H	L
Stream sediment storage and load	H	H	M
Subsurface temperature regime	H	M	H
Surface displacement	H	M	M
Surface water quality	H	H	L
Volcanic unrest	H	L	H
Wetlands extent, structure, and hydrology	H	H	H
Wind erosion	H	M	M

H - HIGHLY influenced by, or with important utility for  
M - MODERATELY influenced by, or have some utility for  
L - LOW or no substantial influence on, or utility for

# Examples of Monitoring

**Erosion Rates**



**Sediment Storage and Loading**



**Shoreline Change**



FY-03

Identify standard protocols and  
identify scientists to develop  
park-specific protocols



# Geologic Monitoring Guide

## Benefits to You

- Provides check list of geologic monitoring needs
- Helps determine significance of each process
- Lists examples of human impacts

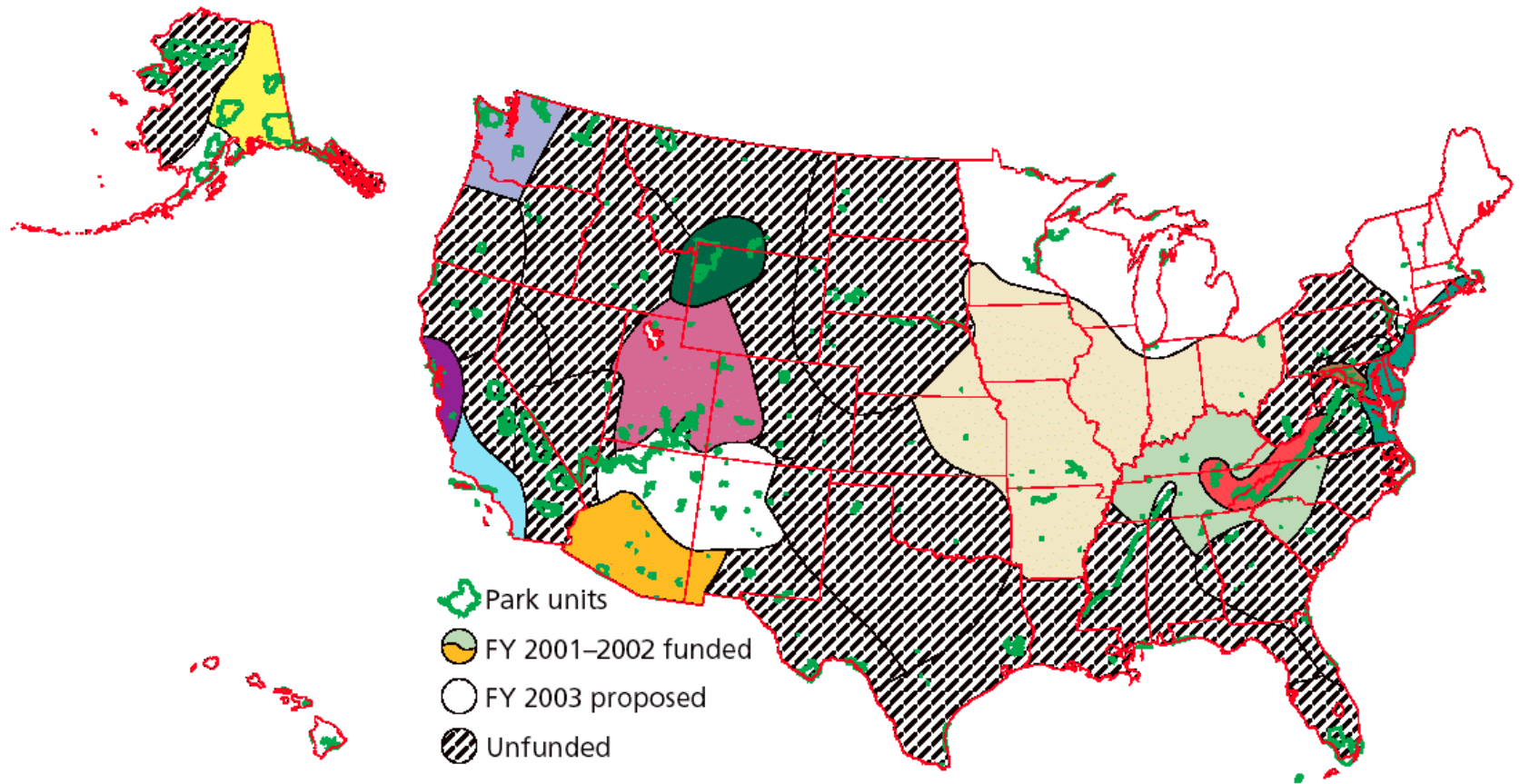


# Monitoring

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- Existing Monitoring

# Scoping Support

## Park Vital Signs Monitoring Networks



# Geology Focus Groups





# What Geology Brings to the Table

- Early warning system
- Habitat assessment tool
- Link from geologic processes to threshold limits



# Vital Signs Scoping Support

## Benefits to You

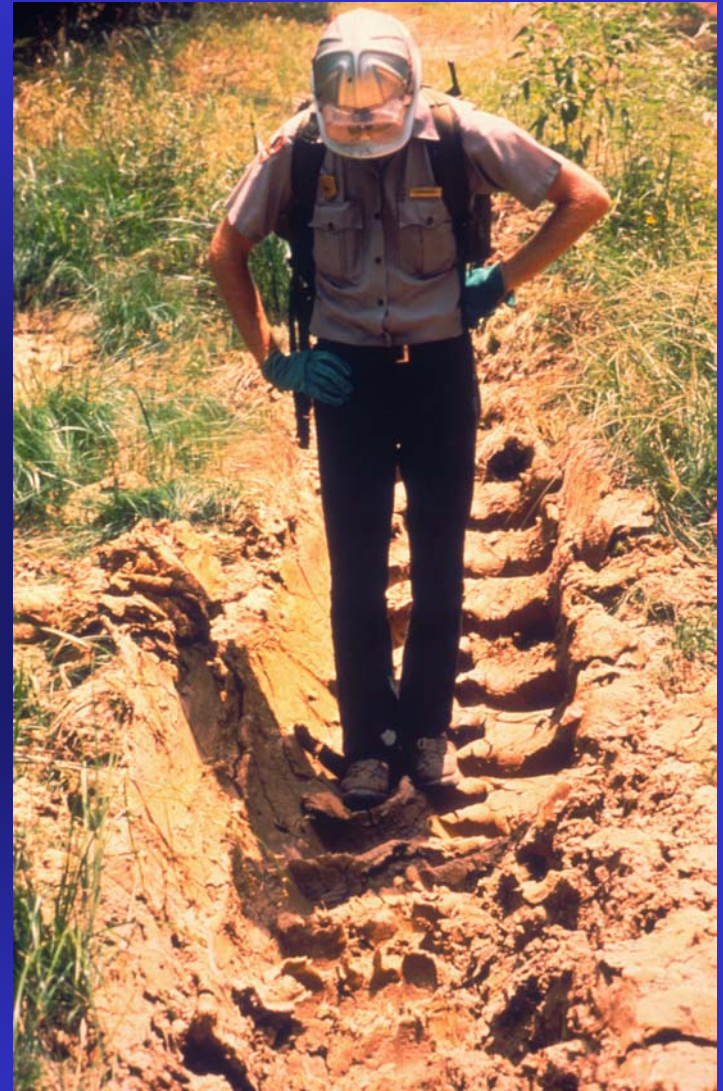
- Allows you to address full array of issues at your workshop(s)
- Gives you prioritized list of geologic of monitoring needs -- network wide or park specific
- Identifies research needs and applicable scientists



# Monitoring

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# Human Influences on Geologic Processes



# Geoindicators Scoping Conducted to Date



Moab group: Natural Bridges, Capitol Reef, Arches, and Canyonlands

# Topics Covered

- What are the significant geologic processes in the park's ecosystems? – and why are they significant?
- Which of these geologic processes is being influenced by human activities both from inside or outside the park?
- How significant to park management are the identified geologic processes and associated human influences – high, moderate, low?
- What sort of geologic baseline data would benefit the park at this time? – why?
- What geological indicators of rapid environmental change (geoindicators) should be monitored in the park? – why? Some suggestions for protocols and people to contact.
- Where are the information gaps? What suggestions do you have for studies or research?
- What are the geologic issues to consider in park planning?



# Final Product



# Scoping of Geologic Processes

## Benefits to You

- Identify baseline inventory and survey needs
- Helps define monitoring needs
- Identifies geologic research needs to fill resource information gaps

Note: We are realizing that human stressors are much more subtle and pervasive than we ever anticipated.



# Monitoring

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# Partners in Monitoring



- Universities
- Organizations
- State Agencies
- Federal Agencies



Long history of geologic monitoring



# Examples



# Partnership Monitoring

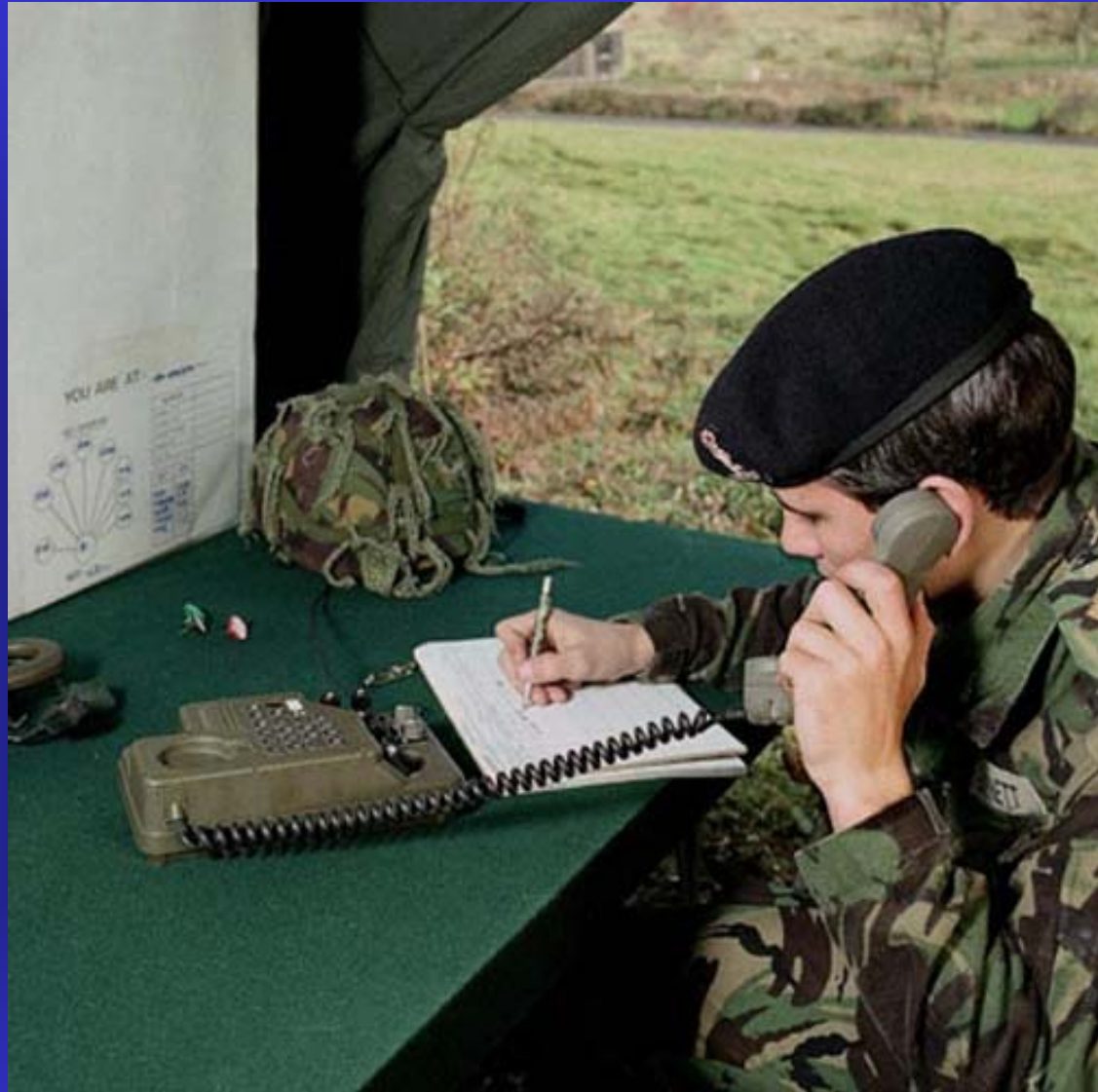
## Benefits to You

- Provides historic record of change
- Provides established monitoring protocols
- Allows economic savings
- Often includes analyzed information:  
patterns and trends



We are ready!





Making the Phone Call -- 50¢



Assembling the Expertise -- \$3,000





Monitoring Vital Signs -- \$20,000



Healthy Ecosystems -- *priceless*